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ABSTRACT

The second session of IT@EDU98 consisted of four papers on multimedia and was chaired by Luu Tien Hiep (Lotus College, Vietnam). "Multimedia Education" (Tran Van Hao, Ngo Huy Hoang) describes "Multimedia Education v. 1.0," an educational software program for elementary school children that uses games to teach counting, spelling, mathematics, geography, memorization, logic, pronunciation, sentence formation, and traffic rules. "Educational Multi-Media in a Networked Society" (Antony Bates) presents a vision of learning in the 21st Century. "Production of Interactive Multimedia Packages" (Tran Minh Phuong) addresses the production steps of interactive multimedia courseware, of which the most important are contents and editing. Experiences are also discussed. "Digital Signal Processing Applied in Multimedia" (Tran Cong Toai, Tran Hoang Buu, Dang Xuan Hieu) provides an introduction to the basic analysis tools and techniques for digital signal processing. (SWC)

SESSION 2

Thursday, 15 January 1998

Session 2: Multimedia

Chair:
Dr. Luu Tien Hiep, Lotus College, Vietnam

2-1. **Multimedia Education**
Prof.Tran Van Hao, University of Education, HCMC,Vietnam
Ngo Huy Hoang, University of Technology, HCMC,Vietnam

2-2. **Educational Multimedia in a networked technology**
Prof.Tony Bates, UBC, Canada

2-3. **Production of interactive Multimedia packages**
Tran Minh Phuong,SCITEC , Vietnam

2-4. **Digital signal processing applied in Multimedia**
Tran Cong Toai,Tran Hoang Buu, Dang Xuan Hieu, University of Technology, HCMC, Vietnam

MUTIMEDIA EDUCATION

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Ngo Huy Hoang
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1. Introduction of Product

The introduction of computers into the schools in many countries of the region has been carried out en masse in many popular ways. Until 1995 the Ministry of Education and Vocational Training had made a big investment in the information cause: 02 US million dollars were spent on computer equipment for Elementary and Secondary schools.

Therefore the formation and development of a model for complete educational tools to help the Vietnamese students to get access to one of the most up todate learning equipment in a fast and easy way has made it a tendency to develop software.

As a result a new educational model "Multimedia Education" has been created. We have made this tool with researching and referencing a number of documents both domestic and abroad issued in the year 1995 and have initial success to apply this new topic. The version 1.0 entered the competition "Young Professional Talents of 1995" and won the first prize. We sincerely hope in the years to come new versions of this first educational tool will be available popularly throughout the country as survey has shown that this new tool has proved to be more interesting, more attractive and effective than those that used to be applied by the older generations.

This tool is made based on the several other educational software such as Just for Kids (Quantum Inc. USA), Computer Assisted Learning (Singapore), Kidware for Education (Germany) and Living Books (Broder Bun - USA, World Class 1995).

Just imagine to learn mathematics without having to learn by rout the Multiplication Tables. Through the games with colorful pictures and sound the children can fast grasp the four calculations, can learn how to read Vietnamese words or learn by heart a poem with the computer.

2. The software Demand

During a survey early 1995 we interviewed with about 50 students of the pedagogical college in Hochiminh City and their same answer is that they all liked the lessons on the computer. We all know that Video games or TV in general have great attraction for the children and we have now turned their interest into something more useful: To play and at the same time learn via the computer. When we asked if the equipment can be furnished at home too most of the students' parents agreed they should.

Before 1995 no such software was made in Vietnam for the children in the elementary schools whilst in other countries in the region such as Singapore and the Philippines a complete set has been introduced into education and successfully applied. In Hochiminh City today many schools have been furnished with computers, even with modern serials but still have got no appropriate software. The majority are still not utilised or just available for games! This is due to the fact that no software was made until then and this was quite a problem not only for those who work in the educational field but also those who work in computer sciences.

3. Objectives

The demands as can be seen are great but the supplies are so scarce. Why? The problem is what is appropriate for the children and in what way. When we finished with this product a number of other programmers started to make their own without much success. The cause for their failure might be the same problem.

Our main objective is to make a accessory tool for the teaching and learning at elementary schools. It could by no way replace the teachers. It carries almost no theory or can't it be seen as school book but just a helping tool. The students before or after the class can have some ideas with new lessons or can revise what they have learned. The software is made into small games which are educational-oriented and/or inducing creativeness. Once they get tired of a certain game they might turn to other ones. However, they should at first be given guidance and later on they can start the games themselves.

4. The Pedagogical Approach

In order to make it appropriate for the elementary levels and to abide ourselves with pedagogical requirements we made a thorough research of school books on Mathematics and Vietnamese. Also Teachers' books concerning the children's psychology.

Many parents have expressed the negative side of pictures and games which are non educational and time consuming. So why not turning them into the positive side, why not bring to them the lessons in the way they like to deal with, the lively, colourful, natural way. This is the right psychological theory in education of the children which says we should bring the children "from lively realistic objectives gradually to the abstract thinking".

Therefore we have chosen the best approach for this topic to put games within the educational model of feedback in order to get the required results / evaluation.

It is commonly known that the children get tired of a game so quickly therefore we organise the games in various levels to match with the their progress. Most of the educational games in the world are being made the same way.

5. Technical Approach

To build up the programme we have taken into account the strong characteristics as well as the weak characteristics of the machine in comparison with man in the field of education. That is way not everything to teach in class can be applied in the machine.

Although being a two-way educational tool, i.e. to get impact on the learners and receive feedback so as to correct their possible mistakes, the ability of the machine is by far poorer than man (the teacher). For example, the machine cannot be able to identify the right speaking of the learner, or the precise spelling of the Vietnamese dictation, etc.

We should therefore try to minimize the weal points of the machine, which does not mean we just avoid them. To correct the mistakes of the learners is a very important point in education, which many software writers often ignore. So we should work out more exercises and never forget the correction parts. This can be done, if necessary with the help of the teachers.

The strong points of the machine, which we all know are the lively pictures and sound it can create so we must exploit the utmost of this multimedia characteristic.

6. Multimedia Education

The following are the complete parts which we have finished in the version 1.0 introduced in 1995 plus the revision.

The set consists of various smaller programmes, each being an educational game. The total version 1.0 are stored in three (3) 1.44 MB floppy discs. In the coming version 2.0 there will be more, which will be available in the year 1998.

The programme in version 1.0 was written with Microsoft Visual Basic 4.0. The programme in version 2.0 will be written with Borland Delphi & Borland C++ Builder.

The programme requires simple configuration: Minimal 386 with Sound Card.

The programme can run in Window 3.1 or later environments.

Installation for version 1.0 is simple:

Insert Disc 1, run SETUP and then follow instructions on the monitor until all is recorded onto hard disc. Then you can start the programme.

Version 2.0 is planned to release on CD-ROM and can be used direct from the disc.

Following are the contents of the programme

Educational Games Available in Version 1.0

1. I Learn How to Count

The objective is to help the child to learn how to count from 1 to 10 by "counting fingers"

2. I Learn How to spell

The objective is to help the child to learn to how to spell basic sounds and sound clusters.

3. I Learn How to Calculate

The objective is to help the child to learn calculations of Adding and Subtracting (+ and -) with cute living beings.

4. I Learn Mathematics with Fun

The objective is to help the child to learn calculations by objective tests with the four basic calculation of Adding, Subtracting, Multiplying and dividing (+, -, x and /)

5. I Learn Mathematics on Blackboard

The objective is to help the child to check their tests of calculations with the help of the familiar "Blackboard". This game creates confidence in the learners and their excitement when the learners volunteer to work out the problems "on blackboard"

6. I Learn Fractions

The objective is to help the child to get familiar with notions of fractions, to identify the fractions, to compare the fractions and the calculation of them

7. I Learn the Sets

The objective is to help the child to get familiar with notions of sets and the simple calculations with setting

8. I Learn the flags

The objective is to help the child to learn Geography and basic information of the large countries in the world

The following are being written in Version 2.0

1. I Learn Poems

The objective is to help the child to how learn by heart poems. The words will be accompanied with pictures and sounds. Sentences are repeated time and again. Words will be erased until the child can learn by hear t the whole poem.

2. I Learn How to Spell 2.0

In version 2.0 the child will be given more sound clusters, how to spell them, how to articulate them and the photos will help them to mimic.

3. I Learn how to Arrange

The objective is to help the child how to arrange the things in logical orders, from small to large or vice versa.

4. I Learn how to Pronounce the Words

The objective is to help the child how to combine the sound clusters to make up the right words that are illustrated with the photos.

5. I Play Football with Subasa

The objective is to help the child to learn the multiplying Charts by funny way *Goals against Subasa.*

6. I Learn How to Make Sentences

The objective is to help the child to learn how to make up the correct sentences with the help of photos

7. I Learn Traffic Rules

The objective is to help the child to learn the traffic rules when going on the roads

EDUCATIONAL MULTI - MEDIA IN A NETWORKED SOCIETY

Antony Bates UBC, Canada

The Technical And Economic Revolution

Multi - media in education is seen by many primarily as an extension of computer - based learning. This is understandable, as some of the main constraints on computer - based learning have been the high cost of incorporating good graphics and video materials, and the restricted sensory stimulation for learners from screen - based text. The addition of high quality graphics, audio, and video to text, and more powerful editing and authoring software, provide a major enhancement of computer - based learning. The costs of hardware and the cost of producing multi - media materials are also dropping rapidly. "Stand - alone" computer - based learning will become even more powerful as artificial intelligence and virtual reality develop.

However, while 'stand - alone' applications of multi - media will continue to be important in education, a much more significant development will be the application of high - speed multi - media networks for educational purposes. As well as the convergence of different media networks for educational purposes. As well as the convergence of different media within a common computer platform, we are also seeing the convergence of the previously separate technologies and industries of computing, telecommunications and television. For instance, in April of this year, Stentor, an alliance of Canadian telephone companies, announced an $8 billion, 10 year initiative, called BEACON, that will bring broadband, multi - media services to 80% - 90% of all homes and businesses in Canada by the year 2004. The social and educational impact of this convergence, and the speed with which it will be implemented, will be revolutionary and deeply challenging to established educational institutions.

At the same time as this technological revolution (and partly because of it), the needs of the workforce are also rapidly changing. In 1993, 78% of all jobs in the USA were in service industries, and the trend is likely to continue (Economist, 1994). Microsoft's annual revenues are greater than Sony's and Honda's combined, but they employ 100 times fewer workers. Most new jobs are being created in Canada by companies with less than 20 workers; indeed, the trend to both self - employment and working from home is likely to grow (StatsCan, 1992).

The wealth of nations will depend increasingly on knowledge - based, high - tech industries. but if every worker currently in the workforce was sent back to college for three months training every five years, we would have to increase the post - secondary education system in Canada 50%.

The wealth of nation will depend increasingly on knowledge - based, high - tech industries, in the areas of bio - technology, environmental products and services, computer software, financial services, and entertainment (particularly film and television). Furthermore, these are highly competitive, global industries. Keeping even a few months ahead of the competition, in terms of innovation and knowledge, are critical to survival, as is the quality of product and service. This means that education and training, not just in the pre - work years, but throughout a lifetime, are essential elements of a successful work - force. However, if every worker currently in the workforce was sent back to college for three months training every five years, we would have to increase the post - secondary education system in Canada by 50%. In practice, of course, the political trend is to reduce or limit public expenditure, to make schools and colleges more cost - effective, to take greater numbers for less cost.

Multi - media and modern telecommunications do offer an opportunity to meet these lifelong learning needs of the work - force in a cost - effective manner. This will not happen though without thinking very differently about how education and training will be organized, in order to serve the needs of the work - force.

Learning in the 21st century

Modem learning theory sees learning as an individual quest for meaning and relevance. Once learning moves beyond the recall of facts, principles or correct procedures, and into the area of creativity, problem - solving, analysis, or evaluation (the very skills needed in the work - place in a knowledge - based economy - see Conference Board of Canada, 1991), learners need inter - personal communication, the opportunity to question, challenge and discuss. Learning is as much a social as an individual activity. However, for someone working in a small company, the nearest person with similar interests and expertise may be somewhere on the other side of the country, particularly in leading 0 edge technologies.

Learners will need to access, combine, create and transmit audio, video, text, and data as necessary. If we take this as the design requirement, there is then a need to build a systems that support this form of learning, both for formal and informal learning.

Work and learning will be inseparable. Most learning will be informal and lifelong. It is not difficult to build a convincing portrait of learning at the work - place. We can envisage a computer software designer or television animation artist, called Wayne, probably working from home, needing information on a certain technique or approach, or advice on how best to create a certain effect. From previous experience and contacts, or on the advice of a colleague, he has the name of someone half - way across the country (Sue). From his work - station, Wayne calls Sue, talks about the problem, and Sue loads up some software which she 'shares' with Wayne via the network. Wayne asks a few questions, tries a couple of things on - line while Sue watches and comments, then downloads the software. Sue and Wayne are both registered with an educational institution that has been set up to enable the exchange of commercially sensitive material for learning purposes. Wayne's work - station has automatically displayed the cost per minute of consulting Sue, and the cost of rights for downloading the software. However, Wayne was also able to give Sue some information, and this is charged back to Sue's account. Wayne now not only has the software she needs, but also can contact Sue (on a chargeable basis) any time he has a problem with the software. The learning context has been established. Note it is fragmented, on demand, and charged at cost.

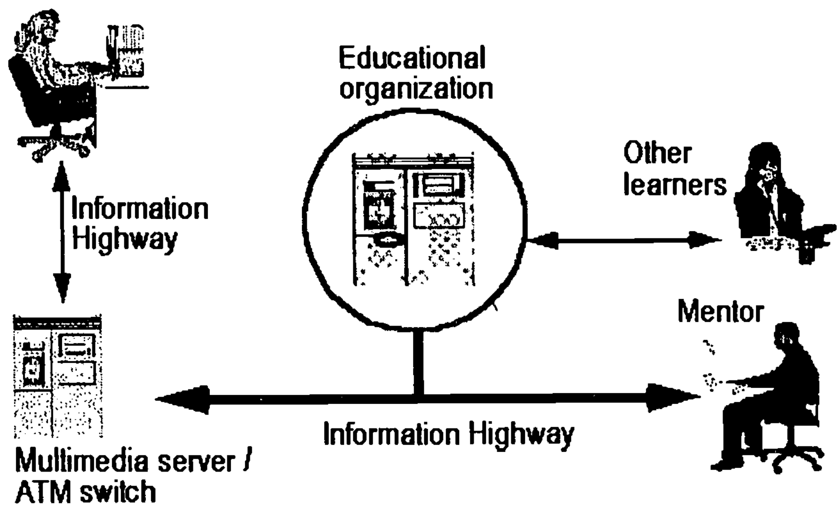
Learners will interact with their desk - top or portable workstations in a variety of ways, determined by the nature of the learning task, and their preferred style of learning in the work situation, These preferred styles will vary considerably, both within a single person, depending on the task, and, for the same task, between different individuals.

The learning context will need to encompass the following :

- working alone, interacting with learning material (which may be available locally or remotely);
- working collaboratively (and in an equal relationship) with fellow workers at different remote sites, either synchronously or asynchronously : both these modes are likely to be multi - media;
- as an 'apprentice' or 'student', working with a more experienced worker, supervisor, or instructor;
- as an instructor, supervisor or more experienced colleague for other less experienced colleagues.
- The same person may find themselves in each of these roles within a single working day. Learners will also need to be able to work from home, or from a work - site, or while in transit. They will need the following :
- access to information (searching, downloading) from multiple sources in multiple formats;
- selection, storage and re-ordering/re - creation of information;
- direct communication with instructors, colleagues, and other learners;
- incorporation of accessed/re - worked material into work documents;
- sharing and manipulation of information/documents/projects with others.

Learners will need to access, combine, create and transmit audio, video, text, and data as necessary. If we take this as the design requirement, there is then a need to build system that support this form of learning, both for formal and informal learning. I give my own personal 'vision' of how such a system would provide the kind of educational experiences I would like to see. This is summarized in Figure 1.

Figure 1 : A networked educational multi - media system



The work - station

The work - station of the future will be a multi - purpose machine, probably in modular form, including input (voice, pen, keyboard, gestures) and display (screen, sound, printer) devices, telecommunications, computing and television. It will be at least in part portable.

Key features will be the interface between the user, the tools available to the learner within the workstation, and a range of remote services, both educational and non - educational, that can be accessed remotely via the work - station.

The interface

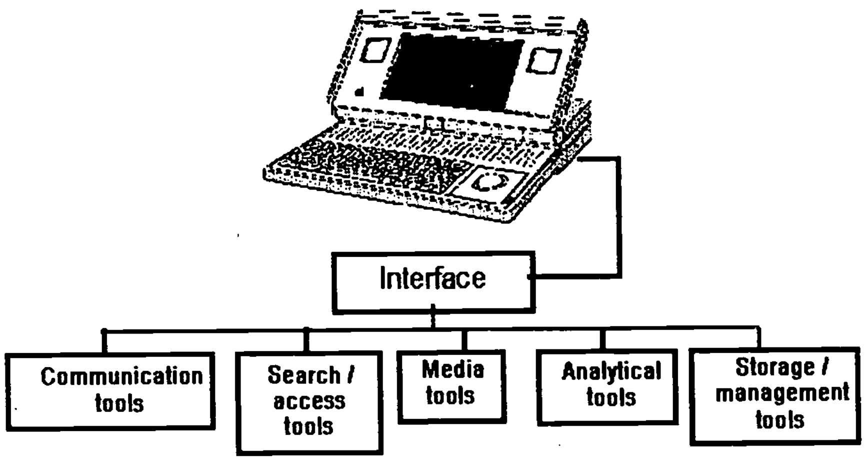
Design work has already begun on building interfaces for educational services on the information highway. The Virtual Interactive Environment for Workgroups (VIEW) is one such system currently in the initial stages of development in Canada by MPR Teltech, the Open Learning Agency, Simon Fraser University, Science World (British Columbia), the British Columbia Educational Technology Centre, and Stentor. The VIEW system will provide tools for creating and using 'multimedia conferences', and for enabling users to engage in individual and collaborative group activities using information from diverse sources and in a variety of media formats, operating either in synchronous or asynchronous modes (Teles and Laks, 1993).

In essence, when learners switch on their work - station, there is a window with a choice of services. One of the choices (others may be films, home shopping, financial services, messages, etc.) will be education and training. When the learner chooses education and training, VIEW will provide a new window, with a choice of educational services, and a choice of a range of software tools to facilitate the learning and communication process. Thus learners will be able to search, access and download information from a variety of sources in a variety of media formats.

The tools

The software tools available in the work - station will be a critical element of this interface (Figure 2).

Figure 2 : An educational multi - media networked interface



As well as tools for communication, management and storage of information, there will also be tools that assist in searching, accessing and compressing information, in analysing accessed data for relevance, in 'grouping' appropriate types of information, and tools for importing different types of media - based information, editing, and exporting them. These tools will be intuitively simple to use.

What will make or break such a system will be the creation of new organizational structures for educational institutions to provide the administrative and educational support for lifelong learners.

The educational institution

What will make or break such a system will be the creation of new organizational structures for educational institutions to provide the administrative and educational support for lifelong learners.

Roles for 'electronic' educational institutions

The critical roles of an 'electronic' educational institution built to meet the learning needs of the 21st century will be as follows :

- To provide information on education and training needs and opportunities;

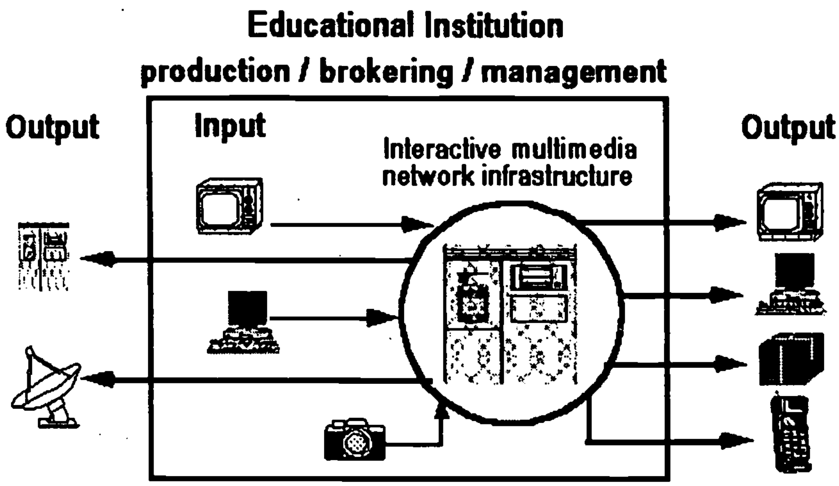
- To provide quality control;
- To provide accreditation, through independent assessment of learning;
- To develop coherent curricula, where appropriate;
- To broker and validate courses and materials from other education and training suppliers;
- To provide the service that will make the use of communications to import and export multi - media learning materials easy and user - friendly;
- To network learners and instructors;
- To create high quality educational multi-media materials in an easily accessible form; to conduct research into education and training needs;
- To apply new technologies, as they develop, to education and training, and to evaluate their use.

Many of the instructors or tutors that are used will not 'belong' or work for the educational institution; many will be independent contractors, or working full - time in a knowledge-based industry, or working for another educational institution. Nor will learners necessarily be 'registered' with that institution, in the sense of taking all or any courses. The institution is primarily a facilitator of learning. In the example of Sue and Wayne, all the educational institution may do is bill, and collect and deliver payment, regarding fees and royalties, to and from Sue and Wayne, the owners of the software, and possibly the telecoms companies (plus a service charge). In other cases, it may offer a full program to groups of students with its own instructors and multi - media materials, leading to its own credential. In others, it will be like a multi - media reference library, with learners just accessing the information they need. It may provide the technology infrastructure for a system of 'mid mode' institutions, that register their own students, but share the technical facilities of the electronic institution. It could be quite a commercial organization, collecting fees for many of its services, where this is appropriate.

The heart of this service is the internal multi - media network infrastructure, that allows the institution to access, create and deliver educational multi - media services in a variety of formats and a variety of modes.

The technical nature of this institution is reflected in Figure 3 :

Figure 3: Technical configuration for an electronic educational institusion

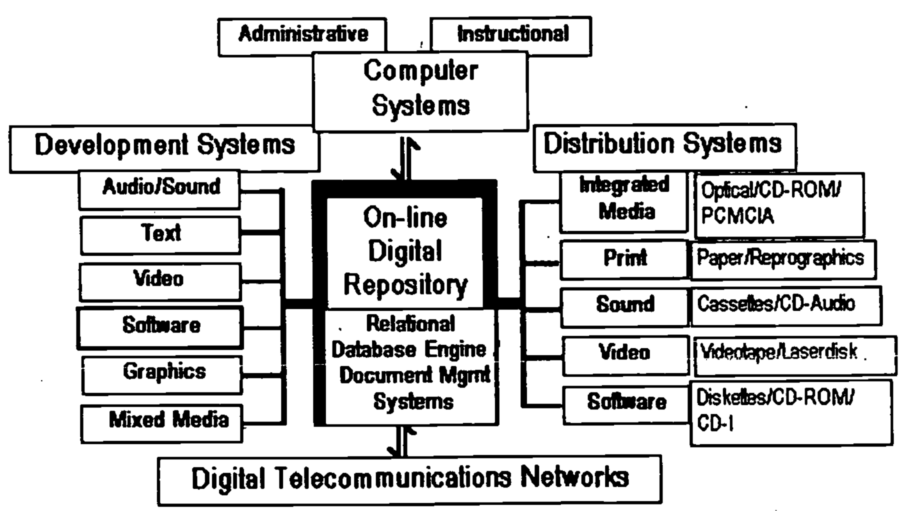


Over the next 10 years, there will be growing variation in the technology that potential learners can access. It will be increasingly important to delicer in whatever formats the learners need.

The internal multi-media network infrastructure

The heart of this service is the internal multi - media network infrastructure, that allows the institution to access, create and deliver educational multi - media services in a variety of formats and a variety of modes. The Open Learning Agency is developing an integrated information management approach that will include both administrative and instructional systems (Figure 4).

Figure 4 : A networked multi-media relational data - base



Basically, learning materials can be accessed, created and stored digitally in any format (video, audio, text, graphics, or any combination). Course designers can access this material electronically, re - edit and re-create learning materials, store and export this learning material in a variety of ways (print, CD - ROM, or down - loaded to local work - stations), depending on the learners' needs. Over the next 10 years, there will be growing variation in the technology that potential learners can access. It will be increasingly important to deliver in whatever formats the learners need.

The system will also allow for the tracking of materials and services, the on-line payment of fees and charges for services, and student or client record - keeping (including grades and credentials), as well as providing management information on finances and learner activities. This infrastructure is connected through the information highway to multi - media servers or switches (Figure 4).

Even for full - time students, it will be difficult to categorize them as either 'campus - based' or 'distance education' students within a few years.

Implications for learning

While schools, colleges and universities will still have reason to provide campus - based learning to groups of learners over set terms or semesters, for social and for some instructional reasons, a great deal of learning will take place outside of this context. Full - time students will in any case soon be a minority in Canadian universities and colleges (63% of all college enrolments in Bristish Columbia were part - time in 1992/93 - B.C. Ministry of Skills, Labour and Training, 1993). Even for full - time students, it will be difficult to categorize them as either 'campus - based' or 'distance education' students within a few years. They will be accessing information and communicating with their instructors, other students, and other subject experts outside their own institution, through multi-media telecommunications, from home and the work - place. Furthermore, multi-media telecommunications will allow them to do this whenever they want, in small chunks as well as in whole courses or programs of study, thus making learning more flexible and accessible, to all ages of learners, and not just young people in the formal system. Learners will also have a much wider choice of sources of learning, being able to access expertise and courses from anywhere in the world.

As important as the context of learning will be the approaches to learning and instruction. Multi-media telecommunications will allow learners and subject experts to engage in dialogue, questioning, and exploration of a wide range of alternative approaches, as well as the sharing and joint working of multi-media telecommunications can also encourage collaborative approaches to learning. Learning will often occur without the direct intervention of a 'formal' instructor, through the use of peers and people working in a job but who have expertise. Most important of all, as they learn through multi - media telecommunications, people will use the same tools and develop the same skills that will be an essential part of their work and leisure activities.

'Stand - alone' multi - media applications will still have an important role to play, especially where learners need to work through carefully a disciplined set of principles and ideas, or need a great deal of practice and experiment to fully understand a subject of study. Their use will increase if learners are given the opportunity to re - work and re-create their own multi - media applications, as projects or for the purposes of assessment. However, stand - alone applications will be a specialized and relatively limited use of nulti-media within a much richer learning environment, that will include two - way communication and the transporting of multi-media materials between learners, and between the learner and a mentor. (More details of the different curricula approaches made possible through multi - media telecommunications are given in Bates, 1993).

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those countries that harness the power of multi - media communications for education and training purposes will be the economic powerhouses of the 21 st century.

Conclusion

This vision for a system is nor a utopia, not even many years away. The wide band highways are at this moment being constructed, and should be in place within 10 years. Multi-media switches, using ATM technology, are now being built. Interfaces to the information highway, and software tools to facilitate multi-media learning, are being designed. The software for handling multi - media communications is being developed by companies such as Oracle.

However, the most difficult part of the system to put in place will be an appropriate educational infrastructure to support the kind of learning needed in the 21st century. The provision of appropriate education and training services to run on the information highway is critical; there is no automatic guarantee that people will use the information highway to an extent that justifies the cost of investment, if services are not provided that meet people's needs. Unfortunately, existing educational institutions were created to meet the needs of a society that are fast disappearing. We need new educational organizations that can exploit the information highway to meet the needs of the 21st century. Economic development will depend as much on the success of creating and supporting such organizations, as on establishing the technological infrastructure. It is critical to get this right because those countries that harness the power of multi - media communications for education and training purposes will be the economic powerhouses of the 21st century.

Acknowledgement

This is based on a presentation made to the World Conference on Educational Multimedia in Vancouver, 1994, and published in the conference proceedings (Ottman and Tomek, 1994). I am grateful to the Association for the Advancement of Computing in Education for permission to reproduce a large part of that paper.

References

[1] Bates, A. W. (1993) 'Educational aspects of the telecommunications revolution in Davies, G. and Samays, B. *Teleteaching* London / New York/Amsterdam : North Holland.

[2] B.C. Ministry of Skills, Labour and Training (1993) *Environmental Scan* Victoria, B.C. : Micistry of Skills, Labour and Training, Policy, Planning and Program Evaluation, p. 28.

[3] Conference Board of Canada (1991) *Employability Skills Profile : The Critical Skills Required of the Canadian Workforce* Ottawa, Ont. : The Conference Board of Canada

[4] Economist (1994) 'Schools brief : the manufacturing myth' *Economist* Vol. 330, No. 7855 (March 19 - 25, 1994), p.91.

[5] Ottman, T. and Tomek, I. (1994) *Educational Multimedia and Hypermedia, 1994* Charlottesville, Va. : Association for the Advancement of Computing in Education.

[6] Stats Can (1992) *Labour Force Survey* Ottawa : Statistics Canada

[7] Teles, L. and Laks, A. (1983) *Virtual Interactive Environment for Workgroups : A Broadband Educational Application* Burnaby, B.C.: The Open Learning Agency.

PRODUCTION OF INTERACTIVE MULTIMEDIA PACKAGES

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Abstract

The development of multimedia technology for microcomputers has opened a new era of applying information technology to education and training fields. Teaching and learning methods have been renovated by interactive multimedia products. This paper deals with production steps of interactive multimedia courseware, of which the most important are contents and editing. Some experiences will be also discussed.

Pedagogical Revolution

From the ending years of the 20th century, we realise that in the information age, a great mass of new knowledge and techniques have to be mastered for their application and adaptation. Consequently a lot of persons have to be trained, retrained and supplemented with new knowledge regularly, if not throughout their working life. Traditional class contact training has become unsuitable vis-à-vis such growth in quality and quantity. Technology-based training appears to be the solution. The development of microcomputers has resulted in new media such as CD-ROM, CD-I, hypermedia, multimedia, computer-based training (CBT) packages, electronic performance support system, Intranet and Internet access facilities...They in turn have modified learning habits, and thus teaching methods. As a matter of fact, with great volume of information on CD-ROM, high level of self-controllability in CBT programs, a learner can choose various learning alternatives, a far cry to the method in which students just listen to the teacher and the latter just delivers a lecture. The teacher nowadays has to think of what students will do to learn, not of what he or she will deliver. Now people talk about interactive multimedia courseware.

From my own understanding and experience I would like to describe in greater detail the way how to develop an interactive multimedia courseware.

Developing an Interactive Multimedia Product

1. Definition

I will try to make clear the concept of interactive multimedia. A more precise definition includes three components:

- *Computer Base* – It is a program runs on a general or specialised computer.
- *Interactivity* – It means a computer will perform nothing until a user sets it in motion.

- *Existence of Graphics and Sound* – Graphics can be images; still or moving pictures; sound can be music, voice and/or special effects.

Since the Compact Disk technology develops, there are many interactive multimedia products, which are roughly classified into ten categories, products given in brackets are typical.

- Reference (Encarta by Microsoft)
- Games (Seventh Guest by Virgin-Tribolyte, Đố vui* (Entertaining Riddles))
- Entertaining Education (Just Grandma and Me by Mercer Mayer, Đảo Phù Thủy* (Sorcerer's Island))
- Entertaining Information (From Alice to Ocean by Odds, Đồng quê Nam bộ qua những bức tranh* (South Vietnamese Countryside through Pictures))
- Education (Virtual Body by IVE, Tìm hiểu về cơ thể con người* (Understanding Human Body))
- Simulation (Fax Simulator*)
- Self-Improvement (Góc sáng tạo* (Creativity Corner))
- Dictionary (MTD by Lạc Việt)
- Demo Samplers

*N.B. The items marked with an asterisk * are produced by Scitec Co.*

2. Technical Issues

Once the product theme and users have been determined, the approach to the product has to be decided before realisation: the product will look like a book, a feature-length film, a picture album, or combinations of them. The approach chosen will affect the cost of production and distribution.

The following table lists the technical factors and some comments which have to be taken into consideration before planning an interactive multimedia product.

Factor	Alternatives	Conditions to consider
Background O/S	DOS, Windows, Macintosh, Multi-Platformed	
Computer	Software, Reading Drive	
Language	Mono-, multi-lingual	Affecting design and storage
Video	Qtime, AVI, MPEG	Compression techniques
Sound	MIDI, WAV	Depending on sound natureand standardisation requirement

Developing Tools	Authoring System: Macro Director, Apple's Hyper Card, Asymmetric's Tool Book, AimTech's Icon Author, Macro-Media's Authorware...), High Level Programming Languages (Visual Basic, Delphi, C, C^{++}...)	Giving rise to different developing cost and time, run speed

3. Human Resource Factors

Development of an interactive multimedia product requires many specialists of different disciplines. They all must be able to work as a well co-ordinated team.

Producer

The person responsible for the whole project from the conceptualisation stage to marketing. A competent producer understands, and better still, has had some practical experience in different production jobs; and now concentrates on business management.

Project Manager

The person in charge of assignment and co-ordination of the rest of the team during production. He or she must has some background in art, music, film, computer programming or engineering, but the most important the project manager must have working experience in different product forms, and command the respect of the team. In our company the manager has been trained in project management so that he knows how to initiate and monitor a project, working procedure, reporting.

Content Specialist

This position can be held by a writer, a teacher or by a team of specialists.

Art Director

It is the person who sets art criteria for the product. He or she can also directly directs the project's artists. The director must have an in-depth understanding of computer interface design and interactivity modes.

Artists

They are persons who can draw, design 2D or 3D graphics, image processing...In most products for children, there are animated cartoons, thus artists to draw them will be included in the team. In games and educational entertainment where graphics are extensively used, the specialization of artists works the same way as in a cartoon film production, but they are trained further with skills required for a specific form of realisation.

Information Designer

The person responsible for layout of the content and the way to realise it. He or she must have a firm understanding of communication, pedagogical method and all the details of the content. The editor can also be the author of the content.

Programmers

Their tools are computer softwares for developing the product. They usually work under a programming head unless this job is undertaken by the very project manager. Since they will have to edit various components of the program latter, a multimedia programmer has to know to manipulate software tools for treatment of sound, image, video...

Camera Operators

If a project requires new film clips, they will produce them. If the clips are used for CD-ROM production, camera operators will have to use special effects for costume color, acting motion, setting layout, lighting...The film clips produced will then be amenable to the suitable form by persons familiar with computer tools.

Sound Engineer

The person in charge of all aspects, including technical and creative, of sound. He or she also cooperates with other sound specialists for sound special effects, actors and actresses for voice recording, and collates in the final product.

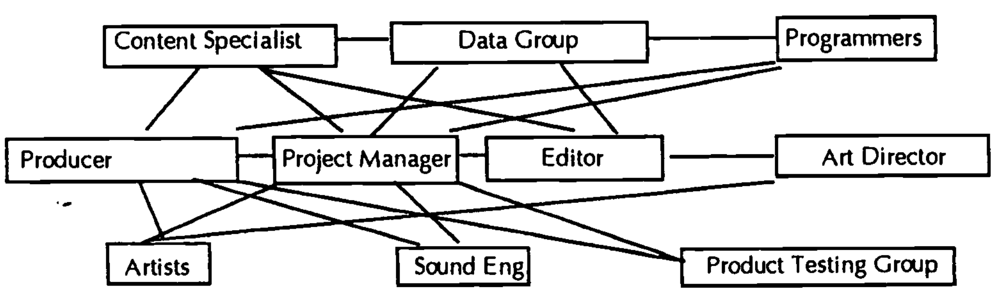
Data Processors

They are responsible for entering text, pictures, sound. Sometimes they have to gather from other sources.

Product Testers

They test the product to make sure that it has been produced according to specifications and standards. In a big production firm, they have to check the whole product. They set up testing standards and plans before actual testing.

The relationship between the team members are described in the following diagram.



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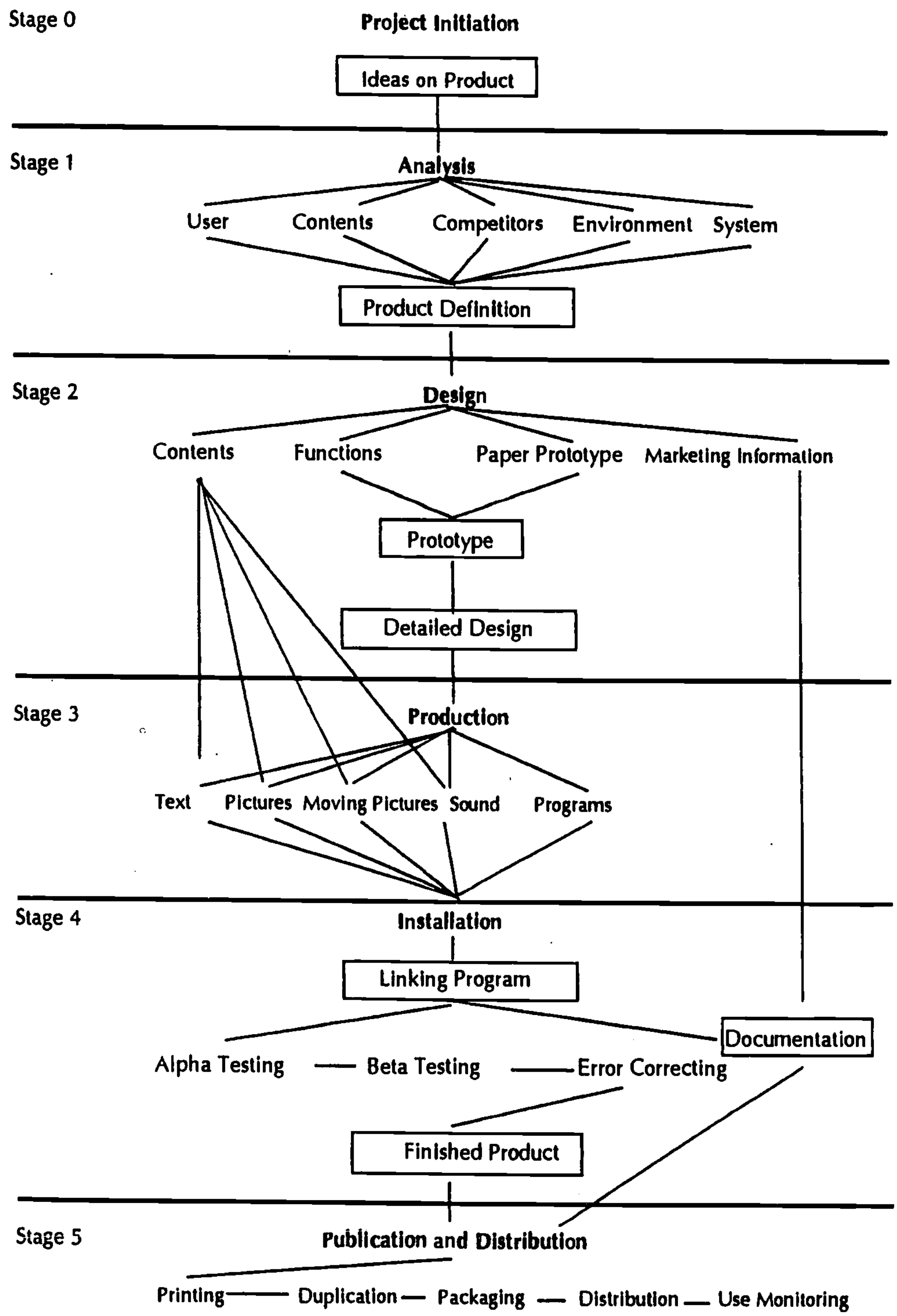
4. Development Procedure

The development of interactive multimedia products like traditional software packages involves five major stages: analysis, design, production, implementation and distribution. Each stage requires tens of different operations. The procedure is summarised in the following diagram.



In order to ensure the initial definition and the final realisation of the product respond well to the needs, bring about benefits and suit exploitation conditions of users, the project team must have measures to approach customers and gather their opinions as soon as possible. It is particularly important for interactive multimedia coursewares.

Evaluation of Pedagogical Contents of Interactive Multimedia Coursewares

As mentioned earlier, while designing an interactive multimedia courseware, the teacher has to think of what a trainee will do to learn but not of what is taught. This is really not customary at all.

The need analysis stage has to be carried out seriously on what learners know and wish to know.

In the alpha testing stage, information on the product collected from learners will assist the production groups to see the effectiveness of their effort. Information collection methods commonly used include objective multiple choice test, test of knowledge before and after using the courseware, interview, observation of learners using the program...The producers can also use a program to record branching paths navigated by learners. This method is particularly useful for courseware in hypermedia, also for understanding the general level of learners and generating a resource for writing instructions for other learners.

Some Experiences

Since the establishment of our multimedia department involving in training and production, we have marketed 18 products covering many areas as mentioned above. For many reasons, we have not carried out extensive evaluation of learning effectiveness of our products. However we still can draw the following lessons.

1. On production team, we still lack creative writers, competent editors. Technical aspects alone do not bring about success to a product.

2. On realisation techniques, we should concentrate much more on the need analysis, existing skills and prospective learners' habits, so that we can produce more acceptable products. It is imperative to check the compatibility of the product against different hardware configurations available on the market, and exploitation environments.

3. On users, Vietnamese customers are very demanding on Vietnamese products. To them the products have to be cheap, of high quality, rich in content, lively characterisation. Some schools utilise our products in practical lessons but with new tools – this wrong approach needs to be rectified by better cooperation between the producer and schools, making the learning process more effective.

DIGITAL SIGNAL PROCESSING APPLIED IN MULTIMEDIA

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1.The problem of Digital signal processing applied in Multimedia

An image is one of the strongest tools that help people with solving a lot of problems , for example , in digital telecommunication , broadcasting , medical imaging and especially Multimedia systems . People can learn a lot of interesting things with the help of images must be and as same as the described objects .So Digital image processing become an important problem in the field of science and engineering .

Multimedia is the star ring in the networking firmament. It allows audio and video to be digitised and transported electronically for display. Most multimedia projects use the MPEG standards and transmit the data over ATM connections.

Literally, multimedia is just two or more media. In practice, the two media are normally audio and video, that is sound plus moving pictures. For this reason, we will begin our study about DIGITAL SIGNAL PROCESSING with an introduction to multimedia.

Digital signal processing (DSP) is an area of science and engineering that has developed rapidly over the past 30 years. For many reasons, especially, the rapid developments in integrated circuit technology has spurred the development of powerful, smaller, faster, and cheaper digital computers and special purpose digital hardware, The advantages of DSP compared with analogue processing such as more reliable, more easily modify the signal functions to be performed by hardware through associated software, and so on, There has been an explosive growth in digital signal processing theory and applications over three decades. The DSP subject is based for some other processing areas, for example, image processing, speech processing, digital communication ... Since then, it has produced a number of powerful tools. Many of which of practical use in engineering to solve difficult problems normally requiring DSP, Two of these tools and technique will be reviewed in this paper. They are: Fast Fourier Transform, Filtering with FIR,IIR filter. These tools have been existence for more than thirty years and have found applications in engineering. In addition, this paper will demonstration some application of those by some included figured extracted from DSP1 program, which performed by students of Information Technology Faculty of HCM Technology University.

Dsp is processing with changing the signal characteristics or extracting some desired information from it, and the signal here has been discrete by sampling and quantification process in AD converter. The signal here can represented as a sequence x[n,m...], and we only review about sequence has one depend variable, time. So, the sequence is x[n].

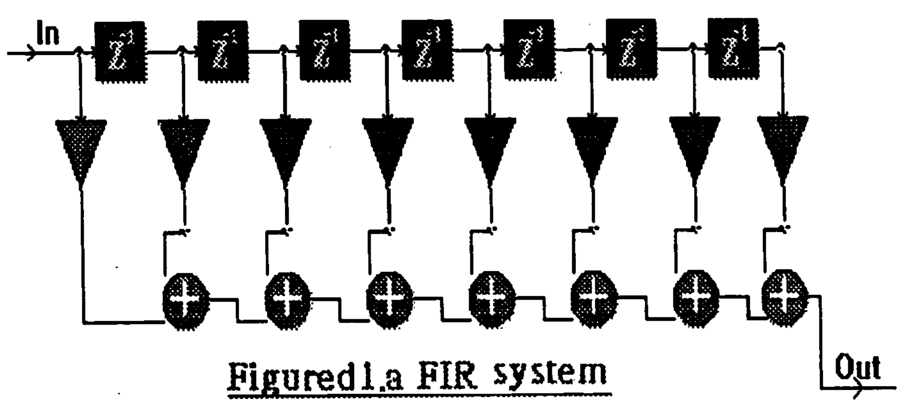
An DSP system can be a device or a algorithm with that operates on discrete -time signal, called *input* or *excitation.* According to some well defined rule, to produce an other discrete time signal call *output* or *response* of the system.

Some important characteristics of a DSP system were considered because of some mathematical techniques that we latterly develop for analysis and design an systems depend heavily on those, they are static or dynamic, Time invariant or time variant, Linear or non-linear, Causal or non-causal, stable or unstable. This paper turn on attention to analysis of the important class of linear, time invariant (**LTI**) system, Which response for any arbitrary input signals can be decomposed and represented as a weighted sum of unit sample sequences.

Suppose that input signal is x[n], and response of system for unit sequence is h[n], we have, response of system for x[n] is y[n] = x[n]*h[n]. where '*' operation is called *convolution sum* or *convolution.*

An DSP system can be analysis in time domain or in frequency domain, Those two topics will be treated later in section 2 and 3, And the important topics now we considered is design and implementation of these of system. In practice, system design and implementation are usually treated jointly rather than separately. Some of realisation of LTI system have been development are direct form ,cascade, parallel and lattice structures, Which have separate advantage, about quantification effect, computationally efficient, memoryless. Two classes of DSP system is considered are **Finite Impulse Response** (*FIR*), and **Infinite Impulse Response** (*IIR*) system, Which characterised by equation

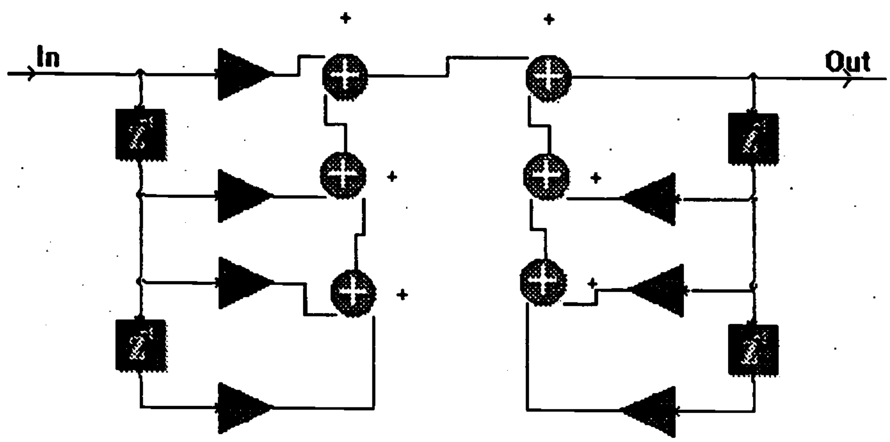
$$y(n) = \sum_{k=0}^{M-1} b_k x(n-k) \qquad (1.1)$$



Figured1.a FIR system
(take by DSP1 Program, N=8)

and

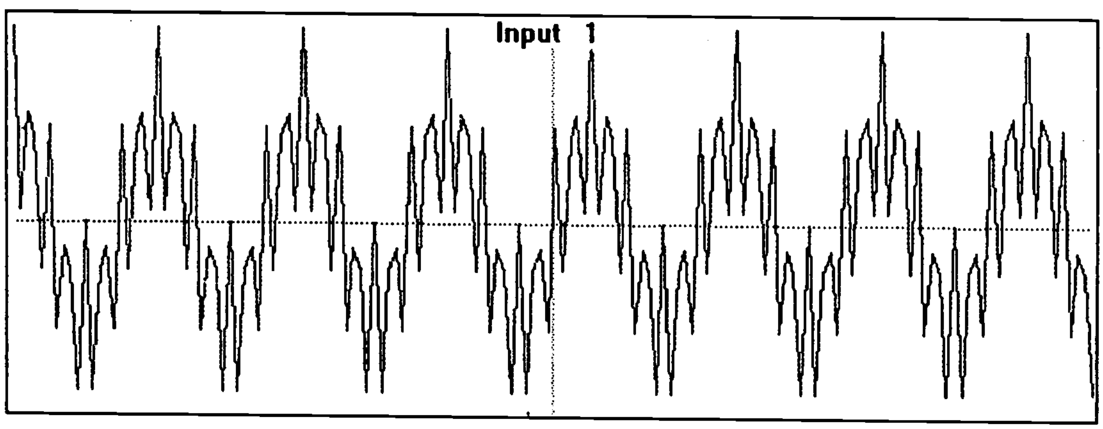
$$y(n) = -\sum_{k=1}^{N} a_k y(n-k) + \sum_{k=0}^{M} b_k x(n-k) \qquad (1.2)$$



Figured 1.b Strucure IIR

The sample was used to illustrate here is sum of number of sinusoid, which have same magnitude (*unity,* for simple) and different *normal frequency* f = F/F_s, where F_s is sampling frequency, and F is frequency of cosine. So, to avoid alias, $0<f<0.5$.

In figure 2, the wave - form of sum of two cosine have frequencies 0.05 and 0.4



Figured 2. Sample waveform (frequency 0.05&0.4)

2. Time Domain Processing (Filtering routine)

Filtering is the most commonly useful signal processing technique. Filter are usually used to remove or attenuate an undesired portion of a signal's spectrum while enhancing the desired portions of the signal. Often the undesired portion of signal is random noise with different frequency content then the desired portion of the signal, Thus, by design a filter to remove some of random noise, the signal to noise ratio can improved in some measurable way.

Filtering can be performed using analogue circuits with continuous time analogue signal or using digital circuit with discrete time digital input. Digital filtering can be perform in time domain or frequency domain, with general computers using previously stored digital samples or in real-time with dedicated hardware. In this section we consider the time domain methods of implement digital filters, In next section we will concern with frequency domain.

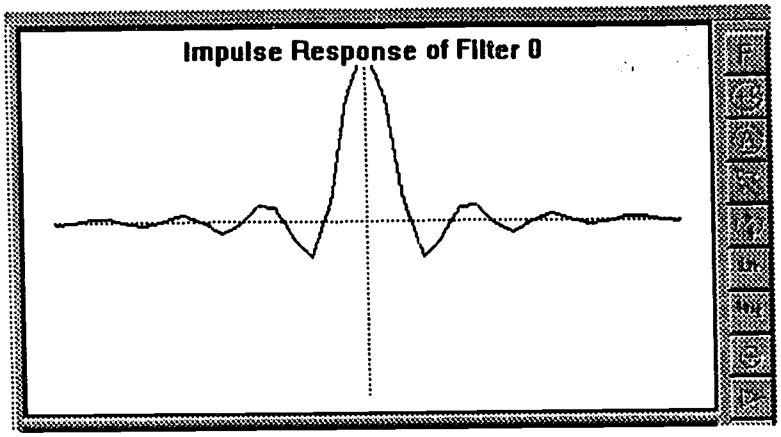
A typical filter structure contain N memory elements used to store the input samples and N memory element used to store output samples. As a new sample come in, the content of each of the input memory elements are copied to the memory elements to the right. As each output sample is formed by accumulating the products of the coefficients and the stored values, the output memory elements are copied to the left. The series of memory elements forms a *digital delay line* , The delayed values used to form the filter output are called *taps*. In the figured 1a, the FIR filter is illustrated and in the IIR figured is in figured 1b.

The FIR filter have several properties that make them useful for wide range of applications. A perfect linear phase response can easily be constructed with an FIR filter allowing the signal to be passed without phase distortion, FIR filters are inherently stable so stability concerns do not arise in the design or implementation phase of development. Even through FIR typical require a large number of multiplies and adds per input samples, they can implemented using fast convolution with FFT algorithm(see section 3). Many techniques have been developed for design and implementation FIR filter.

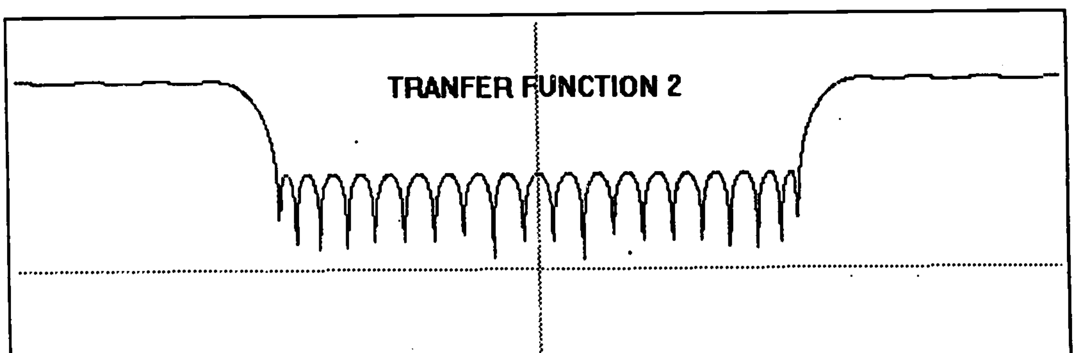
Windowing is perhaps the simplest and oldest FIR design one. But the window design method has no independent control over the passband and stopband ripple . Also the filter with unconventional responses such as multiple passband filters can not be design.

The other method is optimal FIR filter design with equiripple error with different weights in the passbands and stopbands. This class of FIR filters is widely used primarily because of the well-known Remez exchange algorithm developed for FIR filters by McClellan and Parks.

The Impulse response of 35 point FIR lowpass filter design using McClellan-Park program is illustrated in figured 4 and figured 5.



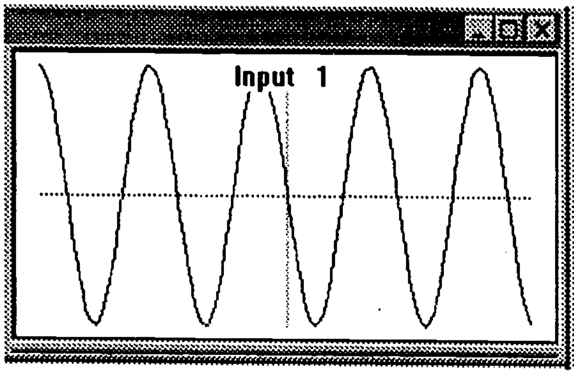
Figured 4. Impuluse Response of lowpass filter



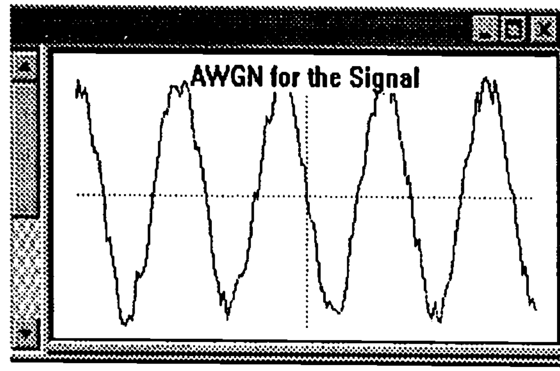
Figured 5. Transfer function of Lowpass filter in figured 4. (taken 1024 points)

Infinite Impulse Response IIR filters are commonly realised recursively by feeding back the weighted sum of past output values and adding this to a weighted sum of the previous and current input values. The advantage of IIR compared to FIR filters is that a given order IIR can made much more frequency selective than the same order FIR filters , in other words, IIR filters are computationally efficient. The disadvantage of the recursive realisation is that IIR filters are much more difficult to design and implement, stability, round-off noise, and sometimes phase non-linear must be considered carefully in all but more trivial IIR filter design. We now review a structure where parallel or cascade some second order section. To design IIR filter, we can use many ways, but by far the most common IIR design method is bilinear transform. This method relies on the existence of a known s-domain transfer function (or Laplace transform) of the filter to be designed, the s-domain filter coefficients are transformed into equivalent z-domain coefficients for use in an IIR digital filter. This might seem like a problem, since s-domain transfer function are just hard as to determine as z-domain transfer functions, fortunately, Laplace transform in s-domain transfer function were developed many years ago for designing analogue filters as well as for modelling mechanical and even biological systems. Thus, many tables of s-domain filter coefficients are available for almost any type of filter function. So the IIR design is performing the bilinear transform from set of s-domain coefficients to z-domain.

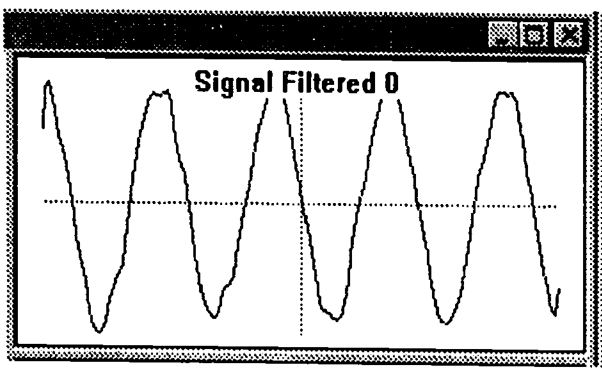
Some Application of filter can be introduced here is filtering a band, filtering noise, and interpolation and decimation.



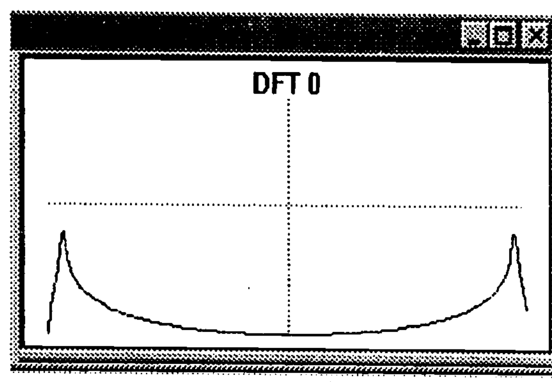
Figured 11a. Original signal to noise (frequency = 0.03,Length = 150)



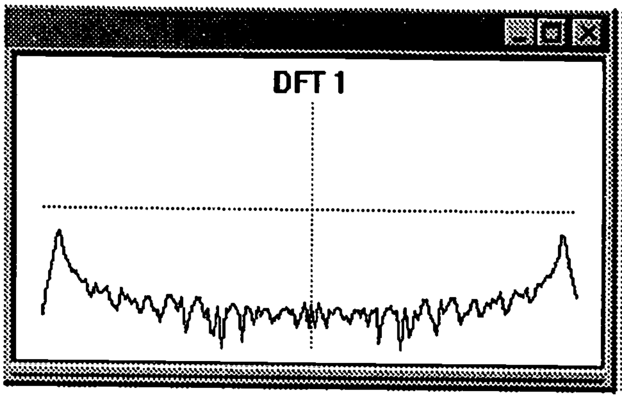
Figured 11. Noise add to signal (150 poitns, factor = 0.3 where maximun of signal is unity)



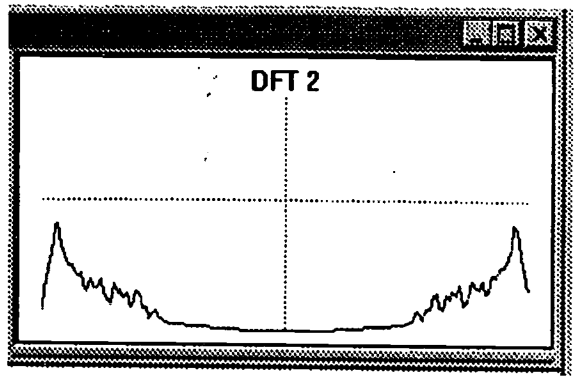
Figured 11c. After Lowpass filtering



Figured 11d. Spectrum of original signal in figured 11a.



Figured 11e. Spectrum of noisy signal in figured 11.b



Figured 11f. Spectrum of signal after lowpass filtering shown in figured 11c

3. Frequency Domain Processing (Discrete Fourier transform & Fast Fourier Transform)

Spectrum analysis is the process of determining the correct frequency domain representation of a sequence. From spectrum analysis information about the underlying frequency content of a sampled waveform such as bandwidth and central frequency is derived. There are many methods to determine frequency content and the choice of method depends on the characteristics of the signal to be analysed. Some of the characteristics important to determining the spectrum analysis method are :

(1) signal to noise ration of the signal;

(2) statistical character of the noise (Gaussian or the other);

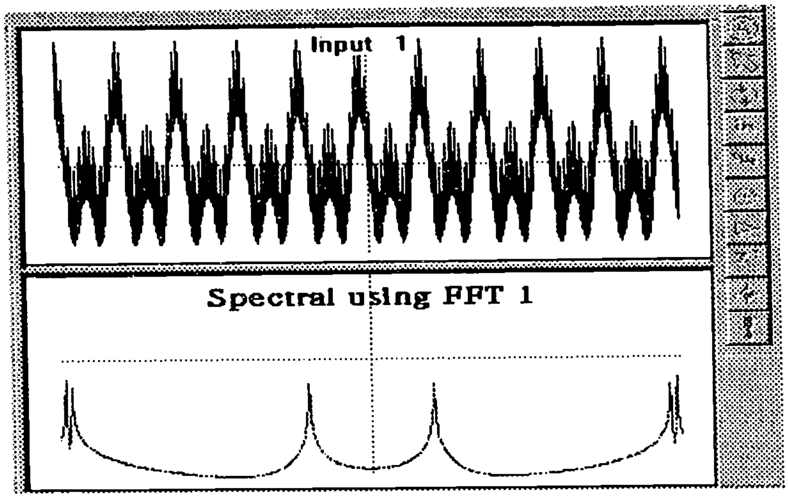
(3) spectral character of the noise (white, colour);

(4) length of sequence compared to rate of sampling

(5) any corruption of the signal due to interference.

There are two broad classes of spectrum analysis techniques : those which are based on Fourier transform and those which are not, We now turn our attention to the first, and the techniques begin with the discrete Fourier transform and its inverse(DFT&IDFT). The reason Fourier transform techniques are so popular and practical is the existence of the fast calculation algorithm, the FFT, which uses the symmetry and periodicity property of DFTs , the development of these computationally efficient algorithms is adopt a divide and conquer approach, this approach is based on the decomposition of an N points DFT into successively smaller DFTs , We now review split N points DFT into 2 N/2 points DFTs , with N is power of 2, and say FFT radix-2 algorithm, there two ways to compute FFTs radix 2 is decimation in frequency(DIF) and in time(DIT) .

The figured 11 is illustrated for FFT and DFT. With the signal sequence input is sum of three sinusoid have 0.01,0.02,0.4.



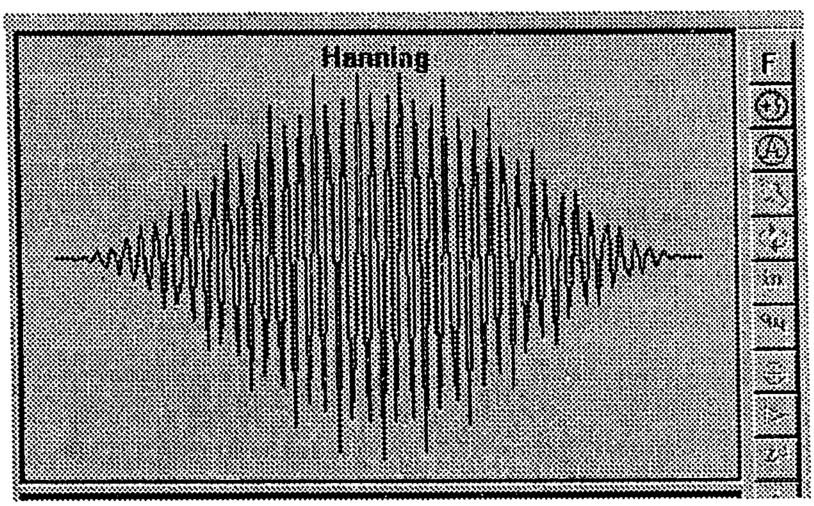
Figured 1. Spectral of signal withs 3 terms (0.01,0.02,0.4)

When we uses FFT or DFT the problem arise is the sideslopes of a spectral output. To reduction that phenomenon, we uses ***window*** , they accomplish this by forcing beginning and end of any sequence to approach each other in value, and for satisfy any sequence this values near to zero, To make up for this reduction in power , windowing process give extra weight to the values near middle of the sequence.

For example the Hanning window is :

$$h[n] = 0.54 - 0.46*\cos(2\pi n/(N-1))$$

The window is illustrated here in figured 8b.



Figured 8b. Hanning Window

The FFT is an extremely useful tool for spectral analysis, the applications of its can be recalled are fast convolution, power spectrum estimation and interpolation/decimation. Once important application of FFTs are often used is *fast convolution* . Most often a relatively short sequence say 20 to 200 points in length (for example, FIR filter) must be convoluted with a number of longer input signal sequences, the input sequence length might be 1000 samples or greater and may be changing with time as, for instance, new data samples are taken. We can straightly implement of time domain convolution equation, but using the convolution theorem , we can have an alternative method

$$x(n) \; < \frac{FFT}{IFFT} > X[k]$$

$$h(n) \; < \frac{FFT}{IFFT} > H[k]$$

$$y(n) \; < \frac{FFT}{IFFT} > Y[k]$$

so, if

$$y[n]= x[n]*h[n]$$

then $$Y[k]= X[k]H[k]$$

(1) we first create array H(k) from impulse response h[n] using FFTs,

(2) then create array X(k) from the sequence x[n] using FFTs.

(3) Multiply H by X point by point thereby obtaining Y(k)

(4) Apply the inverse FFT to Y(k) in order to create y[n].

The speed of FFT make convolution using FFTs a practical technique, In fact many application fast convolution using the FFT can be significantly faster than normal time domain convolution.

The second important application of FFT is *Power spectral estimation* , signal found in most practical DSP systems do not have constant power spectrum. The spectrum of Radar signals, communication signals and voice wave forms change continually with time . This mean that an FFT run on a single set of samples is of very limited use. More often a series of spectral are required at time intervals determined by the type of signal and the information to extracted.

Power spectral estimation using FFTs provides these power spectrum snapshot (called *periodograms*). The average of a series of periodograms of the signal is used as a estimate of the spectrum of signal at a particular time. One common application areas for power spectral estimation is speech recognition. The power spectral of voice signal give essential clues to sound which was being made by the speaker. Almost all the information in voice signals is contained in frequencies below 3500 Hz, A common voice sampling frequency which gives some margin above the Nyquyst rate is 8000Hz. The spectrum of a typical voice signal change every 10 msec or 80 samples at 8000Hz, As a result popular FFT sizes for speech research are 128 points.

The third application is interpolation using FFTs, in section 2 , we was discussed about interpolation in time domain using FIR filters, The interpolation now can be perform in frequency domain using FFTs techniques. The results is the same of that of precise, but speeds are more increase.

4.Conclusion

This paper is only cover some essential parts of DSP, the theory and application in DSP are still left so much, the Objective of this paper is to present an introduction of the basic analysis tools and techniques for DSP. Although the DSP of analog signals has some drawbacks, for example, conversion of an analogue signals into digital form, accomplished by samplings the signal and quantizing the samples, results in a distortion that prevents us from reconstructing the original analog signal from quantized samples, or the finite precision effects that must be considered in DSP, But with all advantage of digital signal processing over analogue signal processing, the DSP is the basic subject of almost of the present processing.

Generally , Digital signal processing is a very important task . The final purpose is to satisfy request of human being . These requests designer to manage to build models of Digital signal processing practically and perfectly .

References

[1] John G.Proakis Dimitris G.manolakis-"Digital signal processing"1996

[2] Akaike,H,-"Power Estimation through auto regression Model Fitting" 1969

[3] Rabiner,L,and Gold,B.,-"Theory and application of digital processing" 1975

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